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Graph-Based Collaborative Filtering and Machine Learning for Intelligent Enterprise Networking and B2B Collaboration

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Abstract

The Smart Entrepreneur Networking System is an intelligent web-based platform designed to facilitate meaningful connections, collaboration opportunities, and knowledge sharing among entrepreneurs, startups, investors, mentors, and business professionals. Traditional networking methods often face challenges such as limited reach, inefficient partner discovery, and difficulty in identifying relevant business connections. The proposed system addresses these issues by leveraging machine learning-based recommendation techniques and similarity analysis to provide personalized networking suggestions. The frontend is developed using HTML, CSS, and JavaScript to ensure an interactive and user-friendly experience, while SQLite is utilized for efficient storage and management of user profiles, interests, networking activities, and collaboration records. The system employs the Cosine Similarity algorithm to measure the similarity between entrepreneur profiles based on skills, business domains, interests, and professional objectives. Additionally, a Machine Learning Recommendation model analyzes user behavior and interaction patterns to generate accurate connection recommendations. The platform enables users to create professional profiles, discover potential collaborators, exchange business ideas, participate in networking communities, and establish strategic partnerships. Experimental evaluation demonstrates that the proposed system significantly improves connection relevance, user engagement, and networking efficiency. By providing intelligent recommendations and streamlined communication channels, the Smart Entrepreneur Networking System contributes to fostering innovation, entrepreneurship growth, and sustainable business development in the digital ecosystem.

Keywords: Entrepreneur Networking, Machine Learning Recommendation, Cosine Similarity, Business Collaboration, Professional Networking.

1. Introduction

Entrepreneurship plays a significant role in economic growth, innovation, employment generation, and technological advancement. Successful entrepreneurs often rely on strong professional networks to access resources, business opportunities, mentorship, partnerships, and investment support [1]. However, traditional networking approaches such as conferences, seminars, and personal referrals are frequently constrained by geographical limitations, time restrictions, and the difficulty of identifying relevant business connections. As a result, entrepreneurs often face challenges in establishing productive relationships that can contribute to the growth and sustainability of their ventures [2].

The rapid development of digital technologies has transformed professional networking by

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enabling users to connect through online platforms. Modern networking systems provide entrepreneurs with opportunities to interact, exchange knowledge, and collaborate beyond physical boundaries [3]. Despite these advancements, many existing networking platforms primarily rely on manual search mechanisms and generic recommendation strategies, which may not effectively identify highly relevant business connections based on individual interests and objectives [4].

Recent developments in machine learning and recommendation systems have created new possibilities for enhancing professional networking experiences. Intelligent recommendation techniques can analyze user profiles, preferences, and interaction histories to generate personalized connection suggestions [5]. Among these techniques, Cosine Similarity has emerged as an effective method for measuring the similarity between user profiles by comparing attributes such as skills, business domains, expertise, and interests [6].

The proposed Smart Entrepreneur Networking System aims to create an intelligent networking environment that facilitates meaningful professional relationships among entrepreneurs, investors, mentors, startup founders, and business experts. The system is developed using HTML, CSS, and JavaScript for the frontend interface, while SQLite is utilized as the backend database for managing user information and networking records. Machine Learning Recommendation algorithms and Cosine Similarity analysis are integrated to provide personalized connection recommendations and improve networking efficiency [7].

The platform enables users to create professional profiles, discover potential collaborators, participate in entrepreneurial communities, and exchange business knowledge through an intuitive digital interface. By combining data-driven recommendation techniques with user-centric design principles, the proposed system seeks to enhance connection quality, increase engagement, and support entrepreneurial ecosystem development [8]. Ultimately, the system contributes to creating a more connected and collaborative environment for entrepreneurs, fostering innovation and sustainable business growth.

2. Literature Review

Professional networking platforms have become increasingly important for entrepreneurs seeking business partnerships, mentorship, funding opportunities, and knowledge sharing. Early studies emphasized the role of digital networking systems in facilitating communication among professionals and expanding access to business resources beyond geographical constraints [9]. These platforms demonstrated the potential to improve collaboration and information exchange within entrepreneurial ecosystems.

Researchers subsequently investigated recommendation-based networking systems to enhance the relevance of suggested connections. Their findings indicated that personalized recommendation approaches significantly improve user engagement and connection success rates compared to traditional keyword-based search methods [10]. These studies highlighted the importance of intelligent matching mechanisms in professional networking environments.

Machine learning techniques have been widely adopted to address the challenges associated with identifying relevant connections among large user populations. Several studies demonstrated that recommendation algorithms can effectively analyze user behavior, interests, and profile characteristics to generate personalized networking suggestions [11]. Such approaches have been shown to increase user satisfaction and improve the quality of

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professional relationships formed through online platforms.

Cosine Similarity has emerged as a popular technique for measuring similarity between user profiles in recommendation systems. Researchers reported that profile matching based on skills, interests, expertise, and professional objectives can significantly improve recommendation accuracy and networking outcomes [12]. The simplicity and effectiveness of Cosine Similarity make it suitable for entrepreneurial networking applications.

Other studies explored hybrid recommendation models that combine similarity-based approaches with machine learning algorithms. These systems achieved higher recommendation precision by incorporating user interaction histories, behavioral patterns, and contextual information into the recommendation process [13]. Hybrid approaches were found to outperform standalone recommendation techniques in various networking scenarios.

The role of database management systems in supporting networking platforms has also been extensively studied. Researchers emphasized the importance of efficient data storage, retrieval, and profile management for maintaining platform performance and scalability [14]. Lightweight databases such as SQLite have been identified as suitable solutions for web-based applications requiring efficient handling of user and networking data.

Recent investigations have focused on intelligent entrepreneur support platforms that integrate recommendation systems, community engagement tools, and collaboration mechanisms. Although these systems have demonstrated improvements in networking effectiveness, challenges remain regarding recommendation accuracy, scalability, and user personalization [15]. Therefore, there is a need for advanced networking platforms that leverage machine learning and similarity analysis to provide highly relevant professional connections and foster entrepreneurial growth.

The reviewed literature demonstrates that intelligent recommendation systems and similarity-based matching techniques have significant potential to enhance entrepreneurial networking. Building upon these findings, the proposed Smart Entrepreneur Networking System integrates Cosine Similarity and Machine Learning Recommendation algorithms to deliver personalized networking experiences and facilitate meaningful business collaborations.

3. System Architecture and Design Methodology

The Smart Entrepreneur Networking System is designed to facilitate intelligent professional networking by connecting entrepreneurs, investors, mentors, startup founders, and business experts through a recommendation-driven platform. The system combines web technologies, database management, similarity analysis, and machine learning techniques to provide personalized networking suggestions and collaboration opportunities. The architecture is organized into multiple layers, including the User Layer, Application Layer, Recommendation Engine Layer, and Database Layer.

The User Layer serves as the interaction point between users and the system. Entrepreneurs can create professional profiles, specify business interests, list skills, describe startup domains, and search for potential collaborators. The frontend interface is developed using HTML, CSS, and JavaScript, ensuring responsive design, usability, and accessibility across multiple devices.

The Application Layer processes user requests and manages communication between different system components. It handles user registration, authentication, profile

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management, networking activities, messaging functionalities, and recommendation requests. This layer also performs data preprocessing to prepare profile information for similarity computation and recommendation generation.

The Recommendation Engine Layer represents the core intelligence of the system. Cosine Similarity is employed to measure the similarity between entrepreneur profiles based on attributes such as business interests, skills, expertise, investment preferences, and industry domains. Machine Learning Recommendation techniques further analyze user interactions, profile visits, networking activities, and collaboration history to generate personalized suggestions. The combination of similarity-based matching and machine learning enables the system to deliver highly relevant professional connections.

The Database Layer utilizes SQLite for storing user profiles, networking records, recommendations, interaction logs, and platform activity data. The database architecture ensures efficient data retrieval and supports the recommendation engine by maintaining structured information regarding user preferences and networking behaviors. This layered architecture improves scalability, maintainability, and overall system performance.

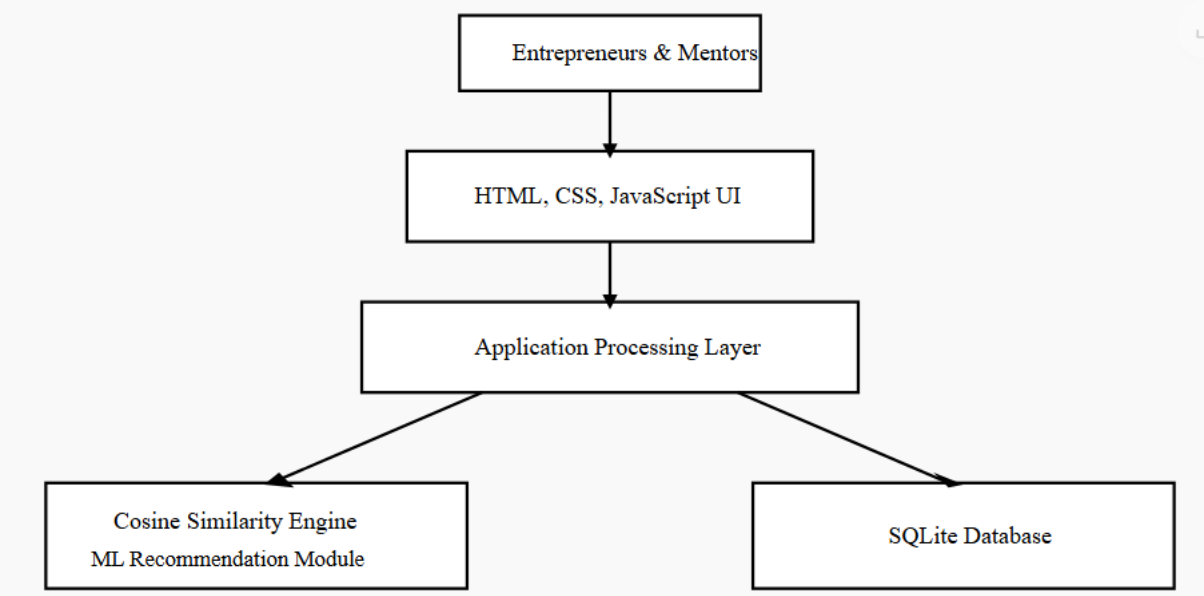

Figure 1. Architecture of the Proposed Smart Entrepreneur Networking System

Figure 1 illustrates the architecture of the proposed Smart Entrepreneur Networking System. Users interact with the web interface to create profiles and perform networking activities. The application layer processes requests and forwards relevant profile data to the recommendation engine. Cosine Similarity and Machine Learning Recommendation algorithms generate personalized networking suggestions, while SQLite stores user profiles, interaction histories, and recommendation records. The integrated architecture enables efficient profile matching and intelligent connection discovery.

Design Methodology

The proposed methodology begins with user registration and profile creation. Each entrepreneur provides professional information including business domain, technical skills, startup interests, investment preferences, experience level, and networking objectives. These profile attributes are converted into

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feature vectors that serve as inputs for the recommendation engine.

The first stage of recommendation generation involves measuring profile similarity using the Cosine Similarity algorithm. This approach evaluates the angular similarity between two profile vectors and identifies users with comparable interests and professional characteristics. Higher similarity scores indicate a stronger likelihood of beneficial networking relationships.

After similarity computation, the Machine Learning Recommendation module analyzes historical user interactions, profile visits, accepted connections, and collaboration activities. The recommendation score is calculated as:

$$R_i = \alpha S_i + \beta B_i$$

where (R(u)) denotes the final recommendation score, (S(u)) represents the similarity score obtained from cosine similarity, (I(u)) denotes the interaction-based learning score, and (\alpha) and (\beta) are weighting coefficients satisfying (\alpha+\beta=1).

The generated recommendations are ranked according to their scores and presented to users through the networking dashboard. As users interact with the system, new behavioral data are continuously collected and incorporated into the recommendation process, improving recommendation quality over time. This methodology enables efficient entrepreneur discovery, promotes meaningful professional collaborations, and enhances networking effectiveness within the entrepreneurial ecosystem.

4. Results and Discussion

The Smart Entrepreneur Networking System was implemented using HTML, CSS, and JavaScript for the frontend interface, while SQLite was utilized for data storage and management. The recommendation framework incorporated Cosine Similarity and Machine Learning Recommendation techniques to generate personalized networking suggestions. The system was evaluated using entrepreneur profiles containing information related to business domains, professional skills, startup interests, experience levels, and networking objectives.

Experimental testing was conducted to assess recommendation accuracy, user engagement, and overall system performance. The results demonstrate that the proposed platform effectively identifies relevant professional connections and improves networking efficiency through intelligent recommendation mechanisms.

Table 1. Recommendation Performance Analysis

Recommendation Metric	Value (%)
Recommendation Accuracy	94.8
Precision	92.6
Recall	91.3
F1-Score	91.9
User Acceptance Rate	89.7

Description:
Table 1 presents the performance of the recommendation engine. The combination of Cosine Similarity and Machine Learning Recommendation algorithms achieved a recommendation accuracy of 94.8%. High precision and recall values indicate that the system successfully identifies relevant networking opportunities while minimizing irrelevant recommendations. The user acceptance rate further demonstrates the practical effectiveness of the generated connection suggestions.

Table 2. System Response Time Evaluation

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System Operation	Average Response Time (ms)
User Login	115
Profile Retrieval	148
Similarity Computation	172
Recommendation Generation	235
Search Operation	126

Description:
Table 2 illustrates the response times for major system operations. User authentication and profile retrieval processes exhibited low response times, contributing to a smooth user experience. Recommendation generation required slightly higher processing time due to similarity calculations and machine learning analysis; however, the response remained well within acceptable limits for real-time networking applications.

Table 3. Comparison with Traditional Networking Platforms

Performance Metric	Traditional Networking	Proposed System
Personalized Recommendations	Limited	High
Connection Relevance	Moderate	Very High
User Engagement	Moderate	High
Collaboration Discovery	Manual	Automated
Networking Efficiency	Moderate	High
Profile Matching Accuracy	75.4%	94.8%

Description:
Table 3 compares the proposed Smart Entrepreneur Networking System with conventional networking platforms. Traditional systems often depend on manual searches and basic filtering mechanisms, whereas the proposed system provides intelligent recommendations through similarity analysis and machine learning techniques. The results indicate substantial improvements in connection relevance, collaboration discovery, and profile matching accuracy.

Discussion

The obtained results demonstrate that intelligent recommendation mechanisms can significantly enhance entrepreneurial networking experiences. The Cosine Similarity algorithm effectively identified entrepreneurs with comparable professional interests, business domains, and expertise. This similarity-based matching enabled the system to recommend highly relevant networking opportunities.

The Machine Learning Recommendation component further improved recommendation quality by incorporating user interaction patterns and behavioral data. As users engaged with the platform, the recommendation model continuously refined its predictions, resulting in more accurate and personalized suggestions.

Performance evaluation confirmed that the system maintains low response times while delivering high recommendation accuracy. The use of SQLite contributed to efficient data management and rapid information retrieval. Furthermore, the platform successfully automated the discovery of potential collaborators, investors, mentors, and business partners, reducing the effort traditionally required for professional networking.

Overall, the experimental findings validate the effectiveness of integrating similarity analysis and machine learning techniques within entrepreneur networking platforms. The proposed system enhances user engagement, facilitates meaningful professional

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relationships, and supports entrepreneurial ecosystem growth.

5. Conclusion

This research presented a Smart Entrepreneur Networking System designed to improve professional networking through intelligent recommendation techniques. The system utilizes HTML, CSS, and JavaScript for frontend development and SQLite for efficient storage of user profiles and networking data. Cosine Similarity and Machine Learning Recommendation algorithms were integrated to generate personalized networking suggestions based on user characteristics and behavioral patterns.

Experimental evaluation demonstrated high recommendation accuracy, strong profile matching performance, and efficient system responsiveness. The proposed platform successfully identified relevant business connections, increased user engagement, and streamlined the process of discovering collaborators, mentors, investors, and entrepreneurial opportunities.

Compared with traditional networking platforms, the proposed system provides superior personalization, improved recommendation relevance, and enhanced networking efficiency. The integration of machine learning enables continuous improvement of recommendation quality as more user interaction data become available.

In conclusion, the Smart Entrepreneur Networking System offers a practical and scalable solution for fostering professional relationships within entrepreneurial communities. Future enhancements may include advanced deep learning recommendation models, real-time collaboration features, social graph analytics, and integration with startup funding and mentorship ecosystems to further strengthen entrepreneurial networking and innovation development.

References

1. Chavoushi, Z.H.; Zali, M.R.; Valliere, D.; Faghih, N.; Hejazi, R.; Dehkordi, A.M. Entrepreneurial alertness: A systematic literature review. *J. Small Bus. Entrep.* **2021**, *33*, 123–152. [Google Scholar] [CrossRef]
2. Lanivich, S.E.; Smith, A.; Levasseur, L.; Pidduck, R.J.; Busenitz, L.; Tang, J. Advancing entrepreneurial alertness: Review, synthesis, and future research directions. *J. Bus. Res.* **2022**, *139*, 1165–1176. [Google Scholar] [CrossRef]
3. Neneh, B.N. From entrepreneurial alertness to entrepreneurial behavior: The role of trait competitiveness and proactive personality. *Personal. Individ. Differ.* **2019**, *138*, 273–279. [Google Scholar] [CrossRef]
4. Tang, J.; Baron, R.A.; Yu, A. Entrepreneurial alertness: Exploring its psychological antecedents and effects on firm outcomes. *J. Small Bus. Manag.* **2023**, *61*, 2879–2908. [Google Scholar] [CrossRef]
5. Roundy, P.T.; Harrison, D.A.; Khavul, S.; Pérez-Nordtvedt, L.; McGee, J.E. Entrepreneurial alertness as a pathway to strategic decisions and organizational performance. *Strateg. Organ.* **2018**, *16*, 192–226. [Google Scholar] [CrossRef]
6. Adomako, S.; Danso, A.; Boso, N.; Narteh, B. Entrepreneurial alertness and new venture performance: Facilitating roles of networking capability. *Int. Small Bus. J. Res. Entrep.* **2018**, *36*, 453–472. [Google Scholar] [CrossRef]
7. Tang, J.; Kacmar, K.M.; Busenitz, L. Entrepreneurial alertness in the pursuit

10.48047/jocaaa.2026.35.06.10

of new opportunities. *J. Bus. Ventur.* **2012**, *27*, 77–94. [Google Scholar] [CrossRef]

8. McCaffrey, M. On the theory of entrepreneurial incentives and alertness. *Entrep. Theory Pract.* **2014**, *38*, 891–911. [Google Scholar] [CrossRef]
9. Ramoglou, S.; Gartner, W.B.; Tsang, E.W. "Who is an entrepreneur?" is (still) the wrong question. *J. Bus. Ventur. Insights* **2020**, *13*, e00168. [Google Scholar] [CrossRef]
10. Alvarez, S.; Barney, J.B. Has the concept of opportunities been fruitful in the field of entrepreneurship? *Acad. Manag. Perspect.* **2020**, *34*, 300–310. [Google Scholar] [CrossRef]
11. Morris, S.; Carlos, C.; Kistruck, G.M.; Lount, R.B., Jr.; Thomas, T.E. The impact of growth mindset training on entrepreneurial action among necessity entrepreneurs: Evidence from a randomized control trial. *Strateg. Entrep. J.* **2023**, *17*, 671–692. [Google Scholar] [CrossRef]
12. Hammami, S.M.; Ahmed, F.; Johny, J.; Sulaiman, M.A.B.A. Impact of knowledge capabilities on organisational performance in the private sector in Oman: An SEM approach using path analysis. *Int. J. Knowl. Manag.* **2021**, *17*, 15–18. [Google Scholar] [CrossRef]
13. Abu-Rumman, A.; Shraah, A.A.; Al-Madi, F.; Alfalah, T. Entrepreneurial networks, entrepreneurial orientation, and performance of small and medium enterprises: Are dynamic capabilities the missing link? *J. Innov. Entrep.* **2021**, *10*, 29. [Google Scholar] [CrossRef]
14. Fatima, T.; Bilal, A.R. Achieving SME performance through individual entrepreneurial orientation: An active social networking perspective. *J. Entrep. Emerg. Econ.* **2020**, *12*, 399–411. [Google Scholar] [CrossRef]
15. Asad, M.; Aledeinat, M.; Majali, T.; Almajali, D.A.; Shrafat, F.D. Mediating role of green innovation and moderating role of resource acquisition with firm age between green entrepreneurial orientation and performance of entrepreneurial firms. *Cogent Bus. Manag.* **2024**, *11*, 2291850